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6 FEBRUARY 1956

WORLD COPPER AND USSR

I. Copper is useful--because of its ductility--as the material for such various objects as pots and pans, tubing and pipe, and the rotation bands on artillery shells. Copper is essential--because of its high conductivity--in the electrical, electronic and communications industries.

A. In today's industrial economy, the demand for copper has brought a rise in world production from about 1 million tons a year, before World War I, to over 3 million tons a year at present.

B. In an average peacetime year (1950), the US alone consumes over a million tons of copper, as follows:

Electrical manufacturing: 30%

Automobiles (NOT including electric components): 14%

Building trades: 13%

Light and power lines: 10%

Telephone and telegraph: 9%

Ammunition (civilian): 7%

Radio and Television: 5%

Other: 12%

C. Military use of copper is heavy. For example, a single 40 mm anti-aircraft gun and carriage contains 700 lbs. of copper, and each heavy tank requires a ton, as does each B-47. A heavy cruiser contains a thousand tons of copper and a FORRESTAL-class carries some two thousand tons.

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- II. In any year the overall world copper supply includes both "virgin" copper fresh from the mines and scrap copper. The production and consumption figures here (chart 1) show only electrolytic copper from "primary" refiners. They do NOT show the large amount of reclaimed copper and copper alloys processed every year by "secondary" users. In the US, for example, we use as much of this "secondary" copper in a year as we do "primary" copper.
- A. On the basis of "primary" refining, these were the major copper producers of the world in 1954:
- B. In the Western hemisphere (over 50% of world production):
1. US--40% (1.2 million tons--763,000 tons from our own mines)
 2. Chile--8% (240,000 tons refined--an amount which is less than the 364,000 tons taken from their mines)
 3. Canada--7% (226,000 tons--less than the 275,000 tons from their mines).
- C. In the Eastern hemisphere:
1. The Bloc--15% (485,000 tons--408,000 tons from their own mines).
 2. Rhodesia & Congo--8% (289,000 tons refined--676,000 tons from mines)
 3. Europe--16% (502,000 tons refined, but only 109,000 tons from local mines)
 4. Asia and Australia--2% (58,000 tons--189,000 tons from their mines)

III. Thus, the Sino-Soviet Bloc, as a whole, produces 15% of the world's annual output of refined copper.

A. Bloc production outside the USSR is small, and two regions within the USSR--Kazakhstan, with about 60% of Soviet production, and the Southern Urals, with about 30%--account for most of the Bloc's copper production.

IV. As shown, three of the major copper-producing regions of the world (Chile, Canada and Africa) actually consume very little copper, while the US and Europe, together, account for three-quarters of the world's consumption.

A. Copper trade (Chart II) shows this movement.

B. Note that the US is unique as both an importer and exporter.

V. With less than one-fifth of world copper production within its boundaries, the Bloc finds itself perennially deficient in copper.

A. In the Fifth "5-Year Plan" (1950-1955) the USSR had hoped to increase its copper production by 90% but actually achieved only a 50% increase. (See chart).

B. During the next "5-Year Plan," the Soviets hope to increase this '55 output by another 60%.

VI. The USSR will not achieve this expansion easily. Since 1939, no new large reserves of copper ore have been discovered in the USSR, and smaller finds have just about equalled the amounts mined.

A. Thus, Soviet copper ore reserves available for future mining today stand at about 20 million tons (as compared with US reserved of some 25 million).

B. Further limiting factors are both the relative poorness of these reserve ores and the technical barriers to economical production of copper from ores of this low grade.

1. The ore in Kazakhstan--over 50% of Soviet reserves--averages only about 1% copper (little above US average).
2. Efficient extraction from such low-grade ores requires plenty of water, but Kazakhstan is particularly poor in water-resources.

VII. Under these circumstances, the Bloc has three other ways to solve its chronic copper deficiency. These are:

- A. Development of new production (possibly in China, where important discoveries have been claimed in both Southwest and Northwest).
- B. Second course is importing copper from Free World (Bloc bought some 100,000 tons of Free World copper in '55 and 130,000 tons the previous year--or more than 20% of its own production).
- C. The third course open to the Bloc is the substitution of other metals--particularly aluminum--in place of copper.

VI. The first of these three courses--new production--offers no immediate prospect for bettering the Bloc's copper deficit.

- A. Even if the new Chinese reserves are proved, years of development and substantial capital investment will necessarily precede actual production of Chinese copper in significant quantities.
- B. The second course--purchases from the Free World--probably offers the easiest means for closing the Bloc copper gap, so long as the world price is not exorbitant.

1. Actually, since COCOM embargo on copper wire was lifted (Aug '54), open Bloc purchases of Free World copper have fallen off somewhat while bloc attempts at clandestine and costly procurement of other still-embargoed forms of Free World copper have declined by 90%.
2. In part, this reflects rising price of copper (from 12¢ lb. in '45 to 50¢ lb. on '55 "spot" market). For example, in '53 (under full embargo), Bloc arranged costly clandestine purchase of 122,000 tons of Free World copper at an estimated cost of some \$100 million (or 38¢ lb.). The smaller amount (100,000 tons) of Free World copper the Bloc bought in '55 also cost them \$100 million (at 50¢ lb.).

VII. However, in the interest of long-range Bloc self-sufficiency, it is the third possible course--substitution--which may now be taking a major place in Bloc thinking.

A. There are strong economic arguments for substituting aluminum for copper. The world over, copper deposits are not only limited in quantity but are becoming lower and lower in quality as better-grade ores are worked out. Expansion of copper output, therefore, is not only difficult but progressively more costly.

1. By contrast, bauxite of good quality is abundant and widely distributed, and increases in aluminum output are made easily and without significant increases in costs.
2. This combination of ready availability and stable price has already made aluminum an economically attractive substitute for copper in world industry.

B. In the US, we have already substituted aluminum for copper in nearly all long-range transmission lines, and same process is under way in automobile industry, refrigeration and construction fields.

1. It would be possible to make 100% substitution, at no loss in efficiency, in electric bus-bars, conduit, many types of wire and cable, tubing, screens, fasteners of all descriptions, cartridge clips, cases and boxes, and any number of utensils. Overall saving in copper could be as great as 20%.
2. Aluminum could further be substituted, without any important loss of efficiency, in valves and fittings, radiators, shell-casings, miscellaneous hardware and appliance items, and some alloys, for an additional possible copper saving of another 20%.

VIII. In view of practicality, economy of aluminum as copper substitute, significant to note that Soviet Sixth "5-Year Plan" calls for expansion Soviet aluminum production by over 100%--from 545,000 tons in '55 to more than one million tons by '60 (US aluminum production in '55 was 1.4 million).

- A. Obviously, cannot say with certainty that USSR and its Bloc associates intend to lick copper problem by starting program of substitution.
- B. However, no question but that expansion of Soviet aluminum production--besides increasing USSR's potential in aircraft and missile fields--will allow Soviet planners undertake such substitution if they so desire.

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C. Military use of copper is heavy. For example, a single 40 mm anti-aircraft gun and carriage contains 700 lbs. of copper, and each heavy tank requires a tons, as does each B-47. A heavy cruiser contains a thousand tons of copper and a FORRESTAL-class carrier some two thousand tons.

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A. On basis of "primary" refining, these were the major copper producers in 1954:

B. Western Hemisphere (Over 50% of world production):

1. US--40% (1.2 million tons--763,000 tons from our own mines).
2. Chile--3% (244,000 tons refined--a lesser amount than the 364,000 tons taken from their mines).
3. Canada--7% (226,000 tons--less than the 275,000 tons from their mines).

C. Eastern Hemisphere:

1. The Bloc--15% (485,000 tons--408,000 tons of it from mines).
2. Africa--mostly from Rhodesia & Congo--9% (289,000 tons refined locally--but a total 676,000 tons from local mines)
3. Europe--18% (502,000 tons refined, but only 109,000 tons from local mines).

4. Asia and Australia--2% (58,000 tons)

--182,000 tons from mines).

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B. Bloc thus finds itself perennially deficient in copper.

1. In the Fifth "5-Year Plan" (1950-1955) the USSR had hoped to increase its copper production by 90% but actually achieved only a 50% increase (See chart).
2. During the next "5-Year Plan," the Soviets hope to increase this '55 output by another 60%.

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B. Further limiting factors on expansion are relative poorness of reserve ores and technical barriers to economical production of copper from ores of this low grade.

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2. Efficient extraction from such low grade ores requires plenty of water but Kazakhstan is particularly poor in water-resources.

VI. Under these circumstances, the Bloc has three other ways to solve its chronic copper deficiency. These are:

- A. Development of new production (possible in China, where important discoveries have been claimed in both Southwest and Northwest).

B. Second course is importing copper from Free World (Bloc bought some 100,000 tons of Free World copper in '55 and 130,000 tons the previous year--or more than 20% of its own production).

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